

# **FAKE NEWS DETECTION USING NATURAL LANGUAGE PROCESSING**

*A project report submitted in partial fulfilment of the requirement for the  
award of degree of*

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### **CERTIFICATE**

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## ABSTRACT

In this modern era, everyone relies on various online resources for news. Since there are many social media platforms like Facebook, Twitter etc., news spread rapidly among millions of users. However, there may be some misleading content for damaging the reputation of people or firms. The fake news propagators intentionally spread fake news to affect public opinion on certain matters. So, to stop spreading this fake news and to rescue innocent people from fake news propagators, detection of fake news at an early stage is very essential. There are various techniques exists to detect fake news, among them natural language processing is one of the techniques which works effectively and efficiently. In natural language processing, text pre-processing techniques such as regular expression, tokenization and lemmatization is used before vectorization. Vectorization is vectorizing the data into N-gram vectors or sequence vectors using terms frequency-inverse document frequency (TF-IDF) or one-hot encoding respectively. N-grams concept is mainly used to enhance the proposed model. In order to observe the accuracy of the model, classification algorithms of machine learning and deep learning models can be used. Fake news detection aims to provide the user with the ability to classify the news as fake or real.

**Keywords:** Fake news, Natural language processing, Deep learning, Machine learning, Tokenization, Lemmatization, Term frequency, Inverse document frequency.

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## **LIST OF SYMBOLS & ABBREVIATIONS**

<b>BERT</b>	<b>:</b>	<b>Bidirectional Encoder Representation From Transformers</b>
<b>DL</b>	<b>:</b>	<b>Deep learning</b>
<b>IDF</b>	<b>:</b>	<b>Inverse Document Frequency</b>
<b>LSTM</b>	<b>:</b>	<b>Long Short Term Memory</b>
<b>ML</b>	<b>:</b>	<b>Machine Learning</b>
<b>NLTK</b>	<b>:</b>	<b>Natural Language Tool Kit</b>
<b>SVM</b>	<b>:</b>	<b>Support Vector Machine</b>
<b>TF</b>	<b>:</b>	<b>Term Frequency</b>

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## 1.INTRODUCTION

### 1.1 Introductory part:

The emergence of information and communication technology greatly increases the number of internet users. Everyone relies on a variety of online resources for news. It changes the way people use information and news from traditional to digital, resulting in comfort and speed for both newsletters and newsreaders. With so many social media platforms like Facebook, Twitter etc., the news is spreading fast among millions of users because social media has made it easier to share information. It makes it easy to access and share data and technology transformation. Definitions of these behavioural changes are natural within the context of those social media platforms: they are often timely and less expensive to feed on social media compared to traditional journalism, such as newspapers or television; and it's easy to share, chat, and share stories with friends or other readers on social media. Fake news has become one of the main concerns as it can undermine governments that put modern society at risk. The widespread of false news can have a devastating effect on individuals and communities. These fraudulent stories are done with the intent to damage or tarnish someone's reputation or the company's reputation. Fraudulent propagandists may do this to claim the Ransom. It is not good for the community at all if it continues. People are now free to access online news and can instantly share news content across social media such as WWW, Google, YouTube, Google+, Facebook, Twitter, and Instagram. Fake news is a threat to democracy in the world, which has undermined the trust of governments, newspapers, and civil society organizations. Determining and minimizing the impact of untrue stories is one of the main problems of modern times and is gaining widespread attention. While truthful websites like Snopes, PolitiFact, and big companies like Google, Facebook, and Twitter, took the first steps to deal with untrue issues. Many societies, including machine learning, database, journalism, political science, and more, pay attention to aspects of false news as a cover subject. There is still much to be done to address the issue of fraud. At the time, spam senders saw this as an opportunity to make money with spam in the news on an ongoing basis. Therefore, the discovery of fake news should be done to save innocent people from fraudulent news broadcasters and spammers. Therefore, to stop spreading these lies and rescue innocent people from counterfeit news broadcasters, early detection of false information is very important. Many researchers have come up with incredible alternatives to fake information. There are a variety of strategies available to detect false stories,

among which natural language processing is one of the most effective and efficient methods as it relates to interactions between humans and computers. We use Natural Language Processing in our project as it deals with construction equipment that easily understands and responds to text or voice data in the same way as humans. With NLP, machines can even perform tasks with spoken or written text. The data processing techniques we use in our project are Lemmatization, Tokenization, Stemming, Stop words and Vectorization. This is how false media coverage can be done using artificial intelligence to save innocent people from fraudulent news and senders of spam. False news detection aims to give the user the ability to classify news as false or real.

## **1.2 Challenges:**

- There are various social media platforms such as Facebook and Twitter. Etc ich people rely on news updates. In these forums, any user can create posts or spread news. However, these forums do not guarantee posts. As a result, some users deliberately spread false stories in these forums to tarnish the image of the company or person.
- The online system leads to the mass production of false news content. Misleading content produced by someone to undermine the dignity of individuals or firms.
- False news broadcasters can do this to claim Ransome. It is not good for the community at all if it continues. Spam senders see this as an opportunity to make money with spam in the news on an ongoing basis.
- Identifying false stories on social media is a challenge because of their versatility. Since spam senders are always on the news in order to make money, news comes from everywhere online.
- The widespread of false news has the potential to have far-reaching effects on individuals and communities. People's opinions can also change in that company or person.
- False news can distort the authenticity of the news ecosystem for example; it is clear that the most popular false news was more widespread on Facebook than the most widely accepted real news during the U.S. presidential election. 2016.
- False stories deliberately entice consumers to simply accept biased or false beliefs. False stories are often used by propagandists to spread political messages or influence, for

example, one report suggests that Russia created fake accounts and public bots to spread lies.

- counterfeit stories change the way people interpret and respond to real stories, for example, some false stories have just been created to arouse mistrust and confuse people; hindering their true and false distinction skills.
- personally, determining the authenticity of a story is a challenging task, often requiring annotations with domain experts who carefully analyze claims and further evidence, context, and reports from authoritative sources.

These are the challenges that the world is facing due to the fake news on online platforms. It is creating negative impacts on innocent people. Fake news propagators and spammers who are the actual spoilers are generating revenue by spamming the fake news. These challenges must be resolved as or the society may face a lot of problems

### **1.3 Solutions to those challenges:**

There are so many problems people are facing in this modern world because of the spread of false news. Any user can easily mislead the public by posting untrue content on social media. People should be aware of false stories on social media. The issue of fraudulent news has received a lot of attention from research communities and requires a very efficient and low-cost solution. Existing identification methods are based on news content or social media using user-based features as an individual. false news has seen unprecedented growth during the 2016 US presidential election. This opened the way for researchers and other stakeholders to find a lasting solution. There have been a variety of solutions developed to help people distinguish between false and real issues however, solutions depend on a machine-based approach or a person-based discovery.

Many commercial solutions have been developed using these methods such as browser extensions and native applications. For example;

(1) The Official Media Impartiality and Truth Extension Extension is based on companies and uses a comprehensive bias library to report bias.

(2) B.S. Detector is based on URL. Searches all links on a given web page to find reference to unreliable sources. It then gives us a clear warning about the existence of questionable links or browsing questionable websites.

(3) FiB analysis is both URL-based, corpus-based and image-based. It provides an algorithm that gives the user credible points. If the algorithm finds the post to be false, it tries to find the truth and show it to the user.

(4) PolitiFace is a traditional app that provides "True-O-Meter" to measure the accuracy of a news item.

(5) Specialist-based authentication relies heavily on personal domain experts to investigate relevant data and documents in order to formulate claims for authenticity. for example, PolitiFact<sup>11</sup>, Snopes<sup>12</sup>, etc. However, expert-focused verification is a process that requires ingenuity and time, limiting the effectiveness of high efficiency and durability.

(6) Criticism-based analysis of crowd sourcing uses "crowd intelligence" so that ordinary people can interpret the content of the news; these annotations are then compiled to produce a complete overview of the authenticity of the news. For example, Fiskkit<sup>13</sup> allows users to discuss and explain the accuracy of certain parts of a news article. As another example, an anti-fraud news button called "Real" is a public account on the LINE<sup>14</sup> instant mobile app, which allows people to report suspicious news content that is also reviewed by editors.

(7) A computational proof-based examination aims to provide an automated measurement system to distinguish true and false claims. Statistical-based assessment methods attempt to solve two major problems: (i) identifying claims that need to be considered and (ii) discriminating the validity of claims.

Although there has been an increase in the number of studies focusing on the analysis and research of false stories and / or aspects of rumors in order to better identify and extract false information, there is still ample space for research in this way as it is not a fully integrated solution. Therefore, stopping the spread of these false stories and rescuing innocent people from false news broadcasters and detecting spam of illegal news in advance is very important. There are various

strategies available to detect false stories, among which natural language processing is one of the most effective and efficient methods. The prerequisites for using an application are as follows: (1) raise the framework for online false information (2) In this project the feature selection algorithm is also the result of natural language analysis. (3) We collect the database, using the IFND database. (4) develops a false news detection system. An important step in pre-NLP processing involves word splitting, token-making, word-stopping, word-stopping, term measurement frequency, word frequency, and opposite text weight. We need as much data as possible to cover the media domain. Thus, data must be collected in order to construct a model. Finally, machine learning acquires feature data where data is divided into three sets: training set, verification set, and test set, each 50%, 20%, and 30%, respectively and divides news articles into three classes: real. , fake, and suspicious. We have used a translator to determine if the news is true or false when the data is provided in any language. The machine learning models used in this project are machine learning and in-depth learning models. The recent success of in-depth reading strategies in complex natural language processing activities, makes it a promising solution for the discovery of false information. Therefore, we have used the Naïve Bayes and the SVM machine learning model as they do well in text-splitting operations. We used the Bert model. This model helps to determine if the stories are false or true. False news detection aims to give the user the ability to classify news as false or real.

## 1.4 Overview:

Everyone relies on a variety of online resources for news. It changes the way people use information and news from traditional to digital, resulting in comfort and speed for both newsletters and news readers. With so many social media platforms like Facebook, Twitter etc., news is spreading fast among millions of users because social media has made it easier to share information. It makes it easy to access and share data and technology transformation. It is so easy to produce news in these forums that there may be false stories. Fake news has become one of the main concerns as it can undermine

governments that put modern society at risk. The widespread spread of false news can have a devastating effect on individuals and communities. First, false news can distort the authenticity of the news ecosystem. false stories deliberately encourage consumers to simply accept biased or false beliefs. Determining and minimizing the impact of untrue stories is one of the main problems of modern times and is gaining widespread attention. While truthful websites like Snopes, PolitiFact, and big companies like Google, Facebook, and Twitter, took the first steps to deal with untrue issues. Many societies, including machine learning, database, journalism, political science, and more, pay attention to aspects of false news as a cover subject. There is still much to be done to address the issue of fraud. There have been a variety of solutions developed to help people distinguish between false and real issues however, solutions depend on a machine-based approach or a person-based discovery. Although there has been an increase in the number of studies focusing on the analysis and research of false stories and / or aspects of rumors in order to better identify and extract false information, there is still ample space for research in this way as it is not a fully integrated solution. First, false news can distort the authenticity of the news ecosystem. false news deliberately entices consumers to simply accept biased or false beliefs. False stories are often used by propagandists to spread political messages or influence, for example, one report shows that Russia has created fake accounts and public bots to spread lies. counterfeit stories change the way people interpret and respond to real stories, for example, some false stories have just been created to provoke mistrust and confusion; interfering with their ability to distinguish truth from falsehood. Therefore, stopping the spread of these false stories and rescuing innocent people from false news broadcasters and detecting spam of illegal news in advance is very

important. The false news detection project aims to give the user the ability to classify news as false or real. In order to determine whether a story is true or false, the model must be constructed using a variety of techniques. We use Natural Language Processing in our project as it deals with construction equipment that easily understands and responds to text or voice data in the same way as humans. With native language processing, machines can even perform tasks on spoken or written text. The Python system provides a variety of libraries and tools for various NLP tasks. Natural Language Toolkit is a collection of opensource resources, programs, and resources for building NLP programs. Natural language processing apps for speech recognition, emotional analysis, question / answer systems, chatbots, etc. The data processing techniques we use in our project are Lemmatization, Tokenization, Stemming, stop words (methods used to break sentences into tokens and abbreviated words) and Vectorization. After pre-processing the data vectorization can be performed on pre-processed data to convert text to numerical representation. We have used a translator to determine if the news is true or false when the data is provided in any language. This is how false media coverage can be done using artificial intelligence to save innocent people from fraudulent news and senders of spam. False news detection aims to give the user the ability to classify news as false or real.

## 2.LITERATURE SURVEY

**[1]. Meesad, P. Thai Fake News Detection Based on Information Retrieval, Natural Language Processing and Machine Learning. *SN COMPUT. SCI.* 2, 425 (2021)**

- Information published online may contain both factual or non-factual news. Therefore, the discovery of fake news should be done to save innocent people from fraudulent news broadcasters and spammers. In this paper, the author has suggested the study of natural language in order to detect counterfeit information as it relates to interactions between humans and computers. It is a way of processing and analyzing large amounts of native language data.
- An important step in pre-NLP processing involves word splitting, token-making, word-stopping, word-stopping, term measurement frequency, word frequency, and opposite text weight. We need as much data as possible to cover the media domain. Thus, data is collected using web robots search. Returning web-based information retrieval is the best way to collect news content from online news websites. It also includes a news collection process and a feature removal process.
- In order to extract feature data natural language processing analyzes retrieved data from web crawling and word segregation separates text into word tokens followed by a cleanup process and continues to clean up separate tokens by removing unwanted words and characters. Finally, machine learning acquires feature data in which data is divided into three sets: training set, verification set, and test set, each by 50%, 20%, and 30% respectively. and it divides the headlines into three categories: real, false, and suspicious.
- The machine learning models used in this paper are Logistic Regression (LR), K-Nearest Neighbor (KNN), Naïve Bayesian (NB), Multilayer Perceptron (MLP), Random Forest (RF), Rule-Based Classifier (RBC), and Memory Short Term (LSTM).

**[2]. Uma Sharma, Sidarth Saran, Shankar M. Patil, 2021, Fake News Detection using Machine Learning Algorithms, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) NTASU – 2020**



- The purpose of this paper is to give the user the ability to classify news as fake or real and to check the authenticity of the news publishing website.
- Database used in this paper LIAR: This database is compiled on the fact-checking website PolitiFact by its API. Includes 12,836 brief statements from people.
- In this paper, four different machine learning algorithms such as Naïve Bayes, Random Forest and Logistic regression algorithms are used for classification. The implementation of these sections was done using the Python Library of Sci-Kit Learn.
- For use, various extruded features such as Tf-Idf and N-grams features are used in three different class dividers. Once we installed the model, we compared the f1 points and looked at the confusion matrix.
- Eventually the selected model was used for the discovery of false information that may be true.

**[3]. Sakeena M Sirajudeen, Nur Fataihah A Azmi, Adamul Abubakar, online fake news detection algorithm, journal of theoretical and Applied information Technology, 2017**

- Suggested method is a multi-layered test method that will be built as an application, in which all information read online is associated with a tag, provided a factual description of the content. There are four algorithms used for algorithm development namely: verifying location, finding false news source, detecting news status and filtering news.
- In this paper, the app is built into java to primarily display the proposed acquisition and verification method which includes the source verification page, news page status and news filtering page.
- A step-by-step algorithm has been set up to detect false stories being spread online and to filter the news appropriately to save innocent people from false news broadcasters.

**[4]. J.C. S. Reis, A. Correia, F. Murai, A. Veloso and F. Benevenuto, "Supervised Learning for Fake News Detection," in *IEEE Intelligent Systems*, vol. 34, no. 2, pp. 76-81, March-April 2019**

In this paper, the author discusses how surveillance algorithms can be used to detect false stories.

- Removing features of false news coverage involves the following steps: 1) features extracted from news content 2) features extracted from a news source and 3) features extracted locally.

- Newsgroup features include information about the publisher of a news article. Therefore, in order to remove these features, the author first passed all the news URLs and extracted the domain information.
- The author has used selective methods such as bias, honesty and trustworthiness, the Domain Area to identify the aspects of false news detection.
- The main purpose of this paper is to highlight the interesting findings about the usefulness and importance of the elements of finding false information and how the methods of obtaining false information can be used in this practice, highlighting challenges and opportunities.

**[5]. Jamal Abdul Nasir, Osama Subhani Khan, Iraklis Varlamis, Fake news detection: A hybrid CNN-RNN based deep learning approach, International Journal of Information Management Data Insights, Volume 1, Issue 1, 2021.**

The word false stories are often described in related books as 'false information,' 'disinformation,' 'deception,' and 'rumors,' which are various forms of false information.

- the fact-finding operation collected data from two popular truth-finding websites and was considered in terms of k-Nearest Neighbors categories to manage screening as a distinguishing function. Wang (2017) has released the LIAR database, which includes 12.8K handwritten short statements from PolitiFact.
- The TI-CNN model (Text Information and Image-based Convolutional Neural Network) has been proposed. The convolutional neural network enables the model to see all the inputs at once, and can be trained much faster than LSTM and many other RNN models SVM, LR, Nave Bayes (NB) and CNN in the database.
- Overall, there are no monitored classification methods that work better than the proposed CNN-RNN hybrid model. Among these methods, Database Forests work best depending on the accuracy of both databases. In the FA-KES, the KNNs had the most accurate performance and at ISOT, it was the Decision Trees.

**[6]. Z. Shahbazi and Y. -C. Byun, "Fake Media Detection Based on Natural Language Processing and Blockchain Approaches," in IEEE Access, vol. 9, pp. 128442-128453, 2021.**

- False news sharing is one of the most popular research issues in recent technology based on a lack of security and trust about the truth of shared news on social media.
- A reinforcing learning approach, learning-based algorithm, a robust decision-making structure and integration with a blockchain framework, a smart contract, and a customized algorithm, well-suited to the Proof of Proof of Authority.
- NLP is a definite task in the process of data preparation that performs data purification, separation, word processing, feature extraction, word identification and embedding.
- In the proposed false detection system, data was collected from online sources and social media platforms such as Twitter, Facebook, BBC News, etc.
- Here we use five models namely XG Boost, Random Forest, RNN, LSTM and Proposed System among these models Random Forest provides the best values for total error (MAE), square root error (RMSE), mean total percentage error (MAPE)), and R2 school.

**[7]. K. Shu, S. Wang and H. Liu, "Understanding User Profiles on Social Media for Fake News Detection," 2018 IEEE Conference on Multimedia Information Processing and Retrieval (MIPR), 2018, pp. 430-435.**

- In this paper, the proliferation of false stories to discover false stories is very important and attracts increasing attention because of the devastating effects on individuals and society.
- Here, create two data sets (BuzzFeed and PolitiFact) with news content and social content information. News content includes news meta-attributes, and social context includes social interaction with news users.
- The list of independent adjectives is related to the profile, related to the content and network by using these attributes to investigate real and false news features.to include gender and age using the regression line model.
- Research has shown that pieces of fake news are widely distributed by bots, and the author will incorporate bot detection strategies to exclude bots from common users in order to better exploit user profile features to detect false news.

**[8]. Ahmad, T.; Faisal, M.S.; Rizwan, A.; Alkanhel, R.; Khan, P.W.; Muthanna, A. Efficient Fake News Detection Mechanism Using Enhanced Deep Learning Model. Appl. Sci. 2022, 12, 1743.**

- In this research article, the author studied in depth the problems of automatically receiving rumors on social media. This study uses a new set of content-based and community-based features to detect rumors. We also used an in-depth reading model in text data using the dual-directed LSTM-RNN section.
- Here are five captured databases namely Charlie Hebdo, Ferguson, Germanwings Crash, Ottawa Shooting and Sydney Siege. These databases include rumors and rumors collected on Twitter during the news.
- SVM works very well in terms of accuracy and memory. The basic SVM results are 0.67, memory is 0.56, and F1 is 0.61. However, our recommended results are 0.69 accuracy and 0.63 F1.

In the future, rigorous testing will be needed to better understand the depth of learning to get the rumors. Due to a large amount of unlabeled data available on social media, we may also create unattended models.

**[9]. Kai Shu, Amy Sliva, Suhang Wang, Jiliang Tang, and Huan Liu. 2017. Fake News Detection on social media: A Data Mining Perspective. SIGKDD Explor. Newsl. 19, 1 (June 2017), 22–36.**

- Due to the rapid spread of false information on social media, we should improve the automatic availability of false information in order to save innocent people from danger.
- In this paper, the author proposes natural language processing to detect false news on social media using semantic information sources.
- In this process, the techniques used are emotional analysis and GRNN (Gated Recurrent Neural Network) Data taken from Twitter rumors and non-rumored conversations posted during the news.
- The proposed SPOT method uses the source of semantic information during the output of the feature. Improving feature selection focuses on retrieving potentially simple features that make

it easier to extract ideas. Accordingly, the proposed method achieves a 97% better memory accuracy compared to the existing method.

**[10]. Kaliyar, R.K., Goswami, A. & Narang, P. DeepFakeE: improving fake news detection using tensor decomposition-based deep neural network. *J Supercomput* 77, 1015–1037 (2021).**

- Fake news has the power to deceive public opinion and therefore can harm the public. Therefore, it is necessary to check the reliability and validity of the headlines shared on social media. In this paper, the author proposes natural language processing to detect false news on social media using the echo-chamber method
- Post-decomposition material has been used as a feature for news classification. Integrated machine learning phase (XGBoost) and deep neural network model (DeepFakeE) employs segmentation function
- A future work plan to make a break based on real-time text of news articles using this content and context-based features in a real-world database (graph-based database)

**[11]. Zervopoulos A., Alvanou A.G., Bezas K., Papamichail A., Maragoudakis M., Kermanidis K. (2020) Hong Kong Protests: Using Natural Language Processing for Fake News Detection on Twitter. In: Maglogiannis I., Iliadis L., Pimenidis E. (eds) *Artificial Intelligence Applications and Innovations. AIAI 2020. IFIP Advances in Information and Communication Technology*, vol 584. Springer**

- In this paper, the author proposes the use of natural language to detect false stories on social media using the echo-chamber method. From this database, Chinese tweets are translated into English, archives and original English tweets. Through the process of independent filtering, important tweets are detected.
- In this paper, the author has suggested the use of natural language in order to detect false news on social media platforms on Twitter. The ML algorithms used for pre-feature processing and selection methods are considered. Literature has seen the effectiveness of the use of Naive Bayes, SVMs (Vector Support Machines) and Decision Trees to predict the accuracy of news.

- A future work plan to make a division based on real-time text of news articles using this content and context-based features in a real-world database (graph-based database).
- Tasks included in this paper. (i) read the impact of translation on the results; (ii) introduce and compare different types of features, especially those related to user and network features; and (iii) use modern ML algorithms, such as deep neural networks

**[12]. “Fake News Detection using Machine Learning and Natural Language Processing” Kushal Agarwalla, Shubham Nandan, Varun Anil Nair, D. Deva Hema, IJRTE, Vol-6, Issue-6, March 2019.**

- The purpose of this paper is to increase the accuracy of false information detection than the current results. News source data sources Facebook, Twitter etc. The accuracy obtained is very low as the details of these sites are 100% reliable.
- In this paper, NPL (pre-natural processing languages) NLTK algorithms used NLTK in python were used to make the body token and title. Deleting stops (refers to the list of NLTK stops), helped to increase all data. The algorithmic method of machine learning used in this paper is the Naïve Bayes algorithm. The accuracy of the model is 74.5%.
- The various models used include the naïve Bayes classifier, the collection and the decision tree. The accuracy rate for finding spam senders is 70% and non-spam for 71.2%. The analytical models used in this algorithm are naïve Bayes, SVM (vector support machines) and Logistic regression.

**[13]. A HYBRID APPROACH TO FAKE NEWS DETECTION ON SOCIAL MEDIA E. M. Okoro<sup>1,\*</sup>, B. A. Abara<sup>2</sup>, A. O. Umagba<sup>3</sup>, A. A. Ajonye<sup>4</sup> and Z. S. Isa, Vol.37 No.2(2018).**

- In this paper a mixed model for finding false news on social media using a combination of both personal and machine-based acquisitions. In the case of fraudulent news, various solutions have been proposed and can be freely divided into machine-based and personal-based solutions.

- The author has suggested five ways to get false news. Of course: 1. Machine-based method. 2. How to use language. 3. Network path. 4. A person-based approach. 5. Hybrid Method.
- The hybrid model consists of two models. They are a Machine-Human-based program, a structured model. Hybrid model solution combines human and mechanical efforts. Based on this, the paper proposes a Machine-Human (MH) model for the detection of false information on social media. The model includes a tool for obtaining literacy issues as well as machine language and network-based methods.

**[14]. Bharadwaj, Pranav and Shao, Zongru, Fake News Detection with Semantic Features and Text Mining (July 24, 2019). International Journal on Natural Language Computing (IJNLC) Vol.8, No.3, June 2019.**

In this paper, the author's aim is to discover false stories in online articles through semantic features and various machine learning methods.

- The mindless Bayes classifier and random forest dividers use five groups of language features. Tested with real or fake data from kaggle.com. The algorithms used are Naïve Bayes, a random forest and Recurrent neural network (RNN) networks.
- The semantic features used include unigram TF & TFIDF, bigrams, trigrams, quad-gram, and embedding of GloVe and empty Bayes, random forest, and RNN separators for false news.
- Performance is promising as bigrams and the random forest gained 95.66% accuracy. It means that semantic features are useful in detecting false news.
- The most efficient model achieved 95.66% accuracy using bigram features with a random forest separator.

**[15]. Fake News Detection Using Machine Learning Approaches, B N Alwasel<sup>1</sup>, H Sirafi<sup>1</sup> and M Rashid, Z Khanam *et al* 2021**

1. This paper analyzes research related to the detection of false information and examines common machine learning models to choose the best one, to create a product model with a supervised machine learning algorithm, which can distinguish false stories as true or false. , using tools like python scikit-learn, NLP text analysis. This process will lead to feature removal and vectorization.

2. In finding false stories by reviewing them in two categories: character exposure and disclosure. In the first section, the basic concepts and principles of false stories are highlighted on social media. During the acquisition phase, current methods are updated to detect false stories using different monitored reading algorithms.

3. Naive Bayes classifier to detect false news from various sources, with results of 74% accuracy. Integrated ML algorithms have been used, but are subject to an unreliable probability limit of 85-90% uses naïve Bayes to get fake news from various social media websites.



Table-2.1 COMPARISON TABLE

Sl.no	Technique	Year	Description	Limitations	Advantages	Performance metrics	Gaps
1	Meesad, P. Thai Fake News Detection Based on Information Retrieval, Natural Language Processing and Machine Learning. SN compt.sci.	2021	In this paper, author proposed natural language processing for fake news detection.	We have a research question on how to make deep learning understand the news more as humans do. Besides, if news comprise sound, and video, the machine must analyze and respond correctly.	Fake news detection aims to provide the user with the ability to classify the news as fake or real.	Author found that LSTM was the best model that achieved 100% on test data measured by accuracy, precision, recall, and f-measure.	Author plan to apply study for a deeper understanding of the language for further investigation. They will need a more complex architecture such as BERT and GPT.
2	Uma Sharma, Sidarth Saran, Shankar M. Patil, 2021, Fake News Detection using Machine Learning Algorithms.	2020	In this paper, four different machine learning algorithms such as Naïve Bayes, Randomforest and Logistic regression algorithms are used for classification.	If news contents are in the form of text, sound, video the predicting whether the news is fake or real is difficult	Detecting the fake news at the early stage is very helpful to save innocent people from fake news propagators	grid search parameter is used to increase the performance which then gave us the accuracy of 75%.	In the future, larger volumes of labeled data will enable us to explore other techniques such as deep learning and push the boundaries of prediction performance

3	Sakeena M Sirajudeen, Nur Fataihah A Azmi, Adamul Abubakar, Online fake news detection algorithm, journal of theoretical and Applied information Technology	2017	The proposed approach is a multi-layered evaluations technique to be built as an app, where all information read online is associated with a tag.	There are some existing software tools for micro blogging sites which are mainly build to combat fake news problem.	The proposed framework is used to detect online fake news and filter that online fake news.	The proposed technique able to detect and filter to reasonable degree of accuracy what constitute an online fake news.	Although the study is a proof-of-concept, the major limitation lies with implementation. Future research should implement the proposed algorithms outlined.
4	J. C. S. Reis, A. Correia, F. Murai, A. Veloso and F. Benevenuto, "Supervised Learning for Fake News Detection," in <i>IEEE Intelligent Systems</i> .	2019	In this paper, author discussed how supervisory algorithms can be used for detecting the fake news.	The data content in the dataset is very less. So, the accuracy may be less since the dataset does not contain large volumes of labelled data.	This paper proposes the main features for fake news detection.	The results reveal interesting findings on the usefulness and importance of features for detecting false news.	In the future, larger volumes of labeled data will enable us to explore other techniques such as deep learning and push the boundaries of prediction performance

5	Jamal Abdul Nasir, Osama Subhani Khan, Iraklis Varlamis, Fake news detection: A hybrid CNN-RNN based deep learning approach, International Journal of Information Management Data Insights, Volume 1, Issue 1	2021	The TI-CNN (Text and Image information based Convolutional Neural Network) model has been proposed.	if news comprise sound, and video, the machine must analyze and respond correctly.	It is difficult to evaluate the fake news content in the online resources. By using an algorithm for detecting the fake news, the innocent people can be saved.	Overall, none of the supervised classification methods performs better than the proposed hybrid CNN-RNN model. Among these methods, Random Forests performed better.	Apart from CNN and RNN, more complex neural networks will be considered as part of future analysis.
6	Z. Shahbazi and Y. -C. Byun, "Fake Media Detection Based on Natural Language Processing and Blockchain Approaches," in IEEE Access, vol. 9, pp. 128442-128453.	2021	Applied the reinforcement learning technique, a learning-based algorithm, to make a strong decision-making architecture.	There are some existing software tools for micro blogging sites which are mainly build to combat fake news problem.	Fake news sharing is one of the popular research problems in recent technology based on lack of security and trust in terms of the truth of shared news in social media.	Among five models used Random Forest gives the best values of mean absolute error, root mean square error, mean absolute percentage error, and R2 score.	In the future, the researchers may explore other techniques in depth when there are larger volumes of labeled data

7	K. Shu, S. Wang and H. Liu, "Understanding User Profiles on Social Media for Fake News Detection," 2018 IEEE Conference on Multimedia and Information Processing and Retrieval (MIPR), 2018, pp. 430-435.	2018	A list of representative attributes are Profile-related, Content-Related, Network-Related by using these attributes to investigate the characteristics of real and fake news.	There are some existing software tools for micro blogging sites which are mainly build to combat fake news problem.	The author investigated the correlation between user profiles and fake/real news.	Experimental results on real-world datasets demonstrate that: i) there are specific users who are more likely to trust fake news than real news; and ii) these users reveal different features from those who are more likely to trust real news.	There are several interesting future directions like exploring other user profile features, identifying a set of potential user profiles for fake news detection.
8	Ahmad, T.; Faisal, M.S.; Rizwan, A.; Alkanhel, R.; Khan, P.W.; Muthanna, A. Efficient Fake News Detection Mechanism Using Enhanced Deep Learning Model. Sci. 2022, 12, 1743.	2022	Machine Learning for Rumor Detection using ML algorithms are SVM, Random Forest, Naïve Bayes and also used Neural network.	The data content in the dataset is very less. So, the accuracy may be less since the dataset does not contain large volumes of labelled data.	This research uses a new set of content-based and social-based features for rumor detection.	SVM performs best in terms of precision and recall. The baseline SVM precision results are 0.67, recall is 0.56, and F1 is 0.61.	In the future, more rigorous tests will be required to better understand how deep learning aids rumor detection.

9	Kai Shu, Amy Sliva, Suhang Wang, Jiliang Tang, and Huan Liu. 2017. Fake News Detection on social media: A Data Mining Perspective. SIGKDD Explor. Newsl. 19, 1 (June 2017), 22–36.	2017	In this paper the author proposed natural language processing using semantic knowledge sources. And techniques such as sentiment analysis and GRNN are applied	If news contents are in the form of text, sound, video the predicting whether the news is fake or real is difficult	In this article, we explored the fake news problem by reviewing existing literature in two phases: characterization and detection.	The models created by super-vised classification methods may be more accurate when trained, whereas unsupervised models can be more practical because unlabeled datasets are easier to obtain.	There are several future directions like Data oriented, Feature-oriented, Model-oriented and Application oriented that are to be improved in the future.
10	Kaliyar, R.K., Goswami, A. & Narang, P. DeepFake : improving fake news detection using tensor decomposition-based deep neural network.	2021	In this paper the author proposed natural language processing for social media fake news detection using echo-chamber technique. The proposed method has been tested on a real-world dataset	If news contents are in the form of text, sound, video the predicting whether the news is fake or real is difficult.	The use of our proposed DNN further improves the performance as compared to both traditional machine learning as well as deep learning algorithms.	Using our proposed model, the value of F1-Score is 0.8511 and 0.8404, respectively, with BuzzFeed and PolitiFact dataset.	The plan for future work is to perform real-time text-based classification of news articles for the real-world dataset (Graph-based dataset)

11	Zervopoulos A., Alvanou A.G., Bezas K., Papamichail A., Maragoudakis M., Kermanidis K. (2020) Hong Kong Protests: Using Natural Language Processing for Fake News Detection on Twitter. In: Maglogianis I., Iliadis L., Pimenidis E. (eds) Artificial Intelligence Applications and Innovation s. springer	2020	In this paper the author proposed natural language processing for social media fake news detection on twitter. In this paper ML algorithms are used for feature preprocessing and selection methods are considered.	The data content in the dataset is very less. So, the accuracy may be less since the dataset does not contain large volumes of labelled data.	Our proposed model (DeepFake E) outperforms with the existing fake news detection methods by applying deep learning on combined news content and social context-based features.	The most highly performing algorithm is Random Forest, achieving an average F1 Score of 92.4%.	Improvement and experimentation in future work: (i) study the impact translation has on the results; (ii) comparing different kinds of feature (iii) utilize more modern ML algorithms, such as deep neural networks
12	“Fake News Detection using Machine Learning and Natural Language Processing” Kushal Agarwalla , Shubham Nandan, Varun Anil Nair,	2019	In this paper NPL (natural preprocessing languages) algorithms NLTK is used NLTK in python was used to tokenize the body and headline.	There are some existing software tools for micro blogging sites which are mainly build to combat fake news problem.	The maximum accuracy of 83% was attained by using Naïve Bayes classifier with Lidstone smoothing. Whereas in the	The various models used include naïve Bayes classifier, clustering and decision tree. Accuracy rate to detect spammers are at 70% and non-spammers	The author tried using their own codes for the project, and the algorithms were relatively slow. So, they decided to use available robust packages in the future to

	D. Deva Hema, IJRTE.				model which consisted of only Naïve Bayes attained an accuracy of 74%	are 71.2%. at	rectify the problems
13	A HYBRID APPROACH TO FAKE NEWS DETECTION ON SOCIAL MEDIA E. M. Okoro1,*, B. A. Abara2, A. O. Umagba3, A. A. Ajonye4 and Z. S. Isa,	2018	The author has proposed five fake news detection systems approaches. They are Machine-based approach, Linguistic approach, Network approach, Human-based approach, Hybrid approach.	Literature does not point to any standardized fake news database that (a) stores all social media news, (b) distinguish news into reliable source and non-reliable source,	Hybrid model solution that combines the efforts of both humans and machine. The model combines the human literacy news detection tool and the machine linguistic and network-based approaches.	The author intends to report the results of this study as future work. The author decided to let us know after he practically apply the model to the real-world example	The author decided to let us know after he practically apply the model to the real-world example.

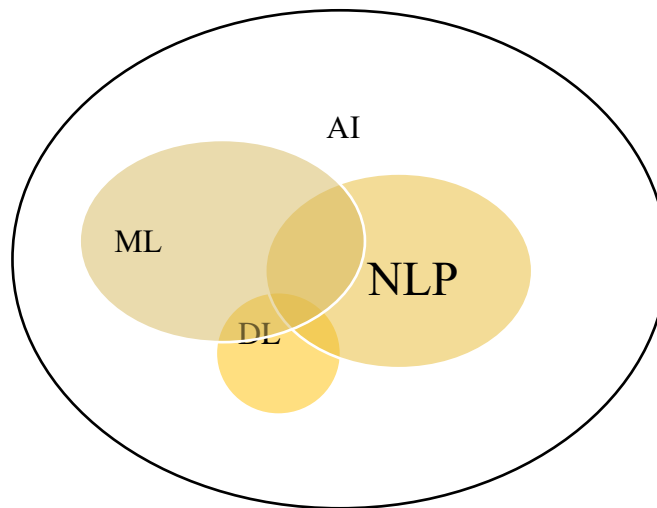
14	Bharadwaj , Pranav and Shao, Zongru, Fake News Detection with Semantic Features and Text Mining (July 24, 2019). International Journal on Natural Language Computing (IJNLC)	2019	The algorithms used are Naïve bayes, random forest, Recurrent neural networks (RNN).	If news contents are in the form of text, sound, video the predicting whether the news is fake or real is difficult	This paper aims to detect fake news in online articles through the use of semantic features and various machine learning techniques.	The best performing model achieved an accuracy of 95.66% using bigram features with the random forest classifier.	As a next step, author proposed semantic features may be combined with other linguistic cues and meta data to improve the detection performance
15	Fake News Detection Using Machine Learning Approaches, B N Alwasell, H Sirafil and M Rashid, Z Khanam <i>et al</i>	2021	This paper makes analysis of the research related to fake news detection and explores the traditional machine learning models.	There are some existing software tools for micro blogging sites which are mainly build to combat fake news problem.	The author explored the traditional machine learning models to choose the best, in order to create a best model.	Naïve Bayes classifier gives the accuracy of 74%. detection model using N-gram analysis achieved the highest accuracy in use contains a unigram and a linear SVM workbook.	The author thought that increasing these features and using random forest will give further improvements to precession results.



### 3 .METHODOLGY

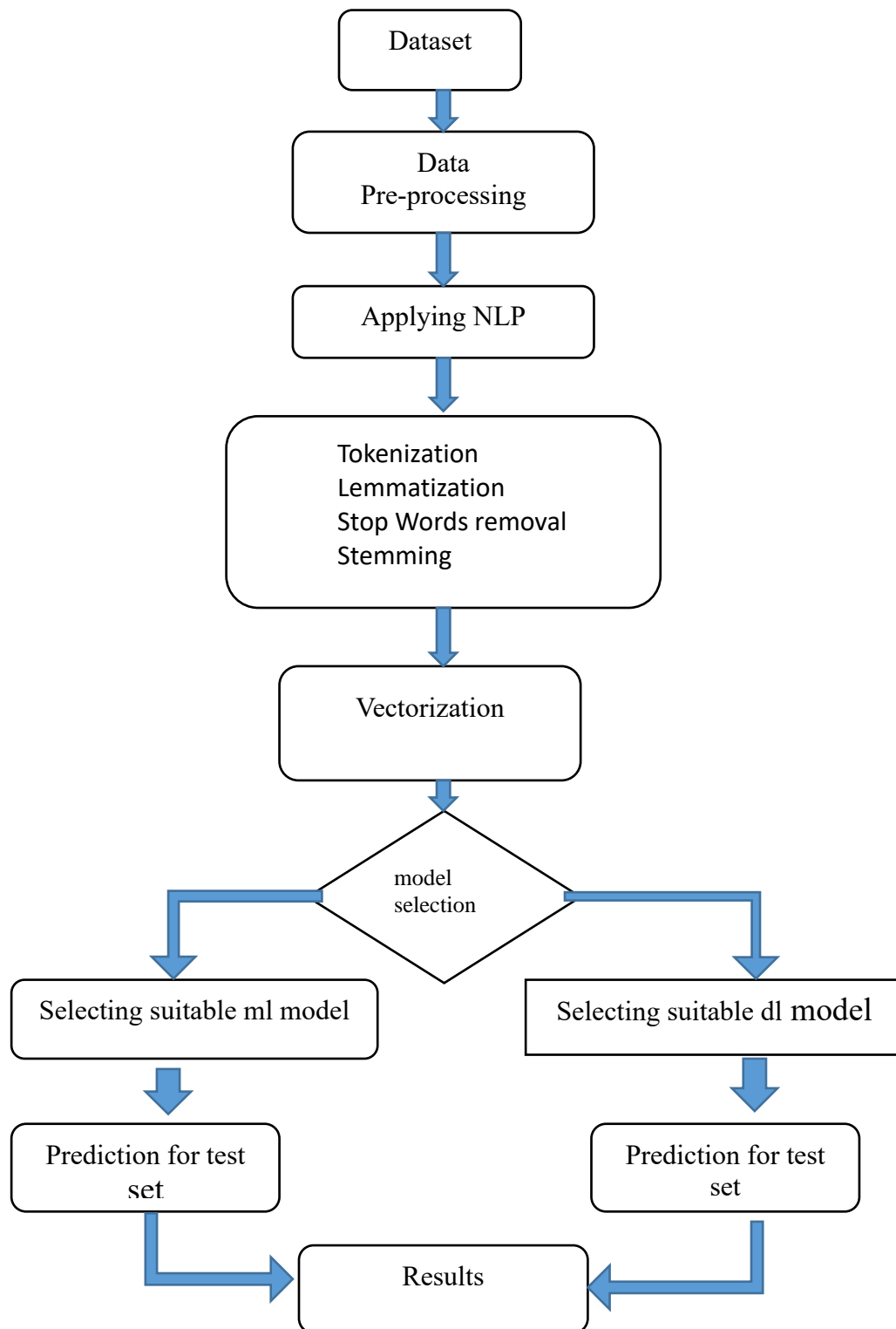
#### PROPOSED MODEL:

- Natural language processing is a form of Artificial Intelligence based on construction equipment that can easily understand and respond to text or voice data in the same way as humans. With NLP, machines can even perform tasks with spoken or written text.
- Steps Involved in Natural Language processing are Data pre-processing such as Tokenization, stemming, Lemmatization and vectorization.
- Separation is the process of dividing a sentence into its own parts of a sentence, usually in line with punctuation. Tokenization is the process of breaking sentences into compound words, that is, breaking data into pieces of information. Stemming is the process of obtaining the name of a word. Word titles give new words when they add attachments to them. Lemmatization is the process of finding the root of a word. The root stem provides a new type of word base.



**Fig.3.1. Classification of AI.**

**Fig.3.2 Flow of the Project Model:**

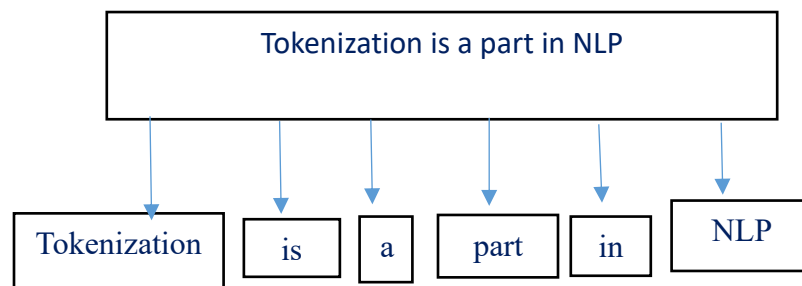


## **Data pre-processing:**

- Data pre-processing is the first and most important step in the development of machine learning models as it is concerned with preparing raw data and adapting the machine learning model.
- The data in the real world is incomplete, noisy, inconsistent, that is, missing attribute values, does not have some interesting features or contains only compiled data and contains inconsistencies in codes or words.
- Quality decisions should be based on quality data because duplicate or missing data may cause inaccuracies or even misleading. Therefore, data correction, cleaning and modification should be done on a given data.
- The whole process of making data more suitable for training is called data pre-processing. It covers a number of functions used in the system to make the data more relevant.
- Major functions in pre-data processing are data cleaning, data integration, data conversion, data reduction, data comprehension.
- The Natural Language Toolkit includes libraries for NLP activities such as stemming, lemmatization, tokenization (methods used to break sentences into tokens and word breaks) etc.
- After pre-processing the data vectorization can be performed on pre-processed data to convert text to numerical representation.
- The three methods that are involved in data pre-processing are in our project are:
  1. Tokenisation
  2. lemmatization
  3. stemming
  4. Stop words

## Tokenization:

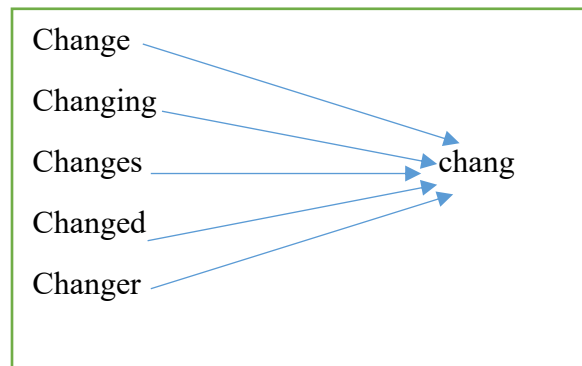
- Tokenization is the process of separating data into native language text into pieces, that is, smaller units called tokens. These tokens help to understand and develop the Natural Language Processing model.
- It is a fundamental and important step in the study of natural language. It is also helpful to define the meaning of a given text by analyzing the word order in the data provided.
- Token making is divided into three types - letter-token, character and n-gram tokens. We use it in our project to detect fake news.
- Each sentence from the database will be processed first, namely, the making of tokens using the internal division function as shown below.
- The benefits of tokenization are a common approach to NLP, smaller fragments may be repeated and thus easier to read.
- Barriers to token production depend on the language in which we operate, we may need to spend time creating or improving the token tool and new ways of making tokens often require data to improve.
- The process of making tokens is often required for tasks such as machine typing or summarizing.
- sentence= 'tokenization is part of NLP'
- Tokenizer\_list =sentence.split()



**Fig.3.3 Tokenization**

**Lemmatization:**

- Lemmatization is a method used to reduce tokens to a standard form i.e., the form of a root dictionary. This process looks at morphological analysis of words to translate words into a common form.
- The process of grouping together the modified forms of a word to be analyzed as the roots of a single word or lemma.
- Reduces the negative wording correctly and ensures that the root of the word (lemma) belongs to the language.
- Lemma is a canonical type, dictionary form, or citation mark form of a set of words.
- Lemmatization is usually more accurate as it uses more informative analysis and always downgrades the dictionary word. It is Very accurate but mathematically expensive.
- Lemmatization focuses mainly on the context in which the word is used.
- Lemmatization methods are used by search engines and chatbots to analyze the meaning of words.

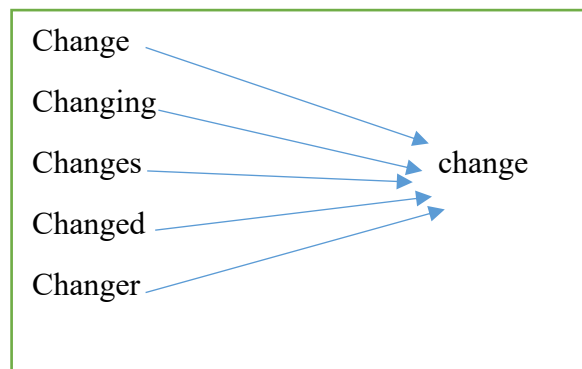


**Fig.3.4 Lemmatization**

**Stemming:**

- Stemming is a form of reducing a word into its own vocabulary that is, the base of words. Stemming basically removes a suffix from a word and cuts it into its root. This process uses a noun stem.

- Stemming techniques used by search engines and chatbots to analyze word meanings to produce better results.
- The stem will be used in the database by creating an object in the porter stemmer section.
- There are two types of shortcomings in cutting such as over stemming and under stemming.
- Over Stemming means that many words are cut off.
- Under stemming are two words of the same stem dipped with different stems.
- Stemming is useful for reducing the particular set of words a model needs to work with and explicitly associates words with similar meanings.
- `Word=PorterStemmer()`
- `Word.stem('changing')`



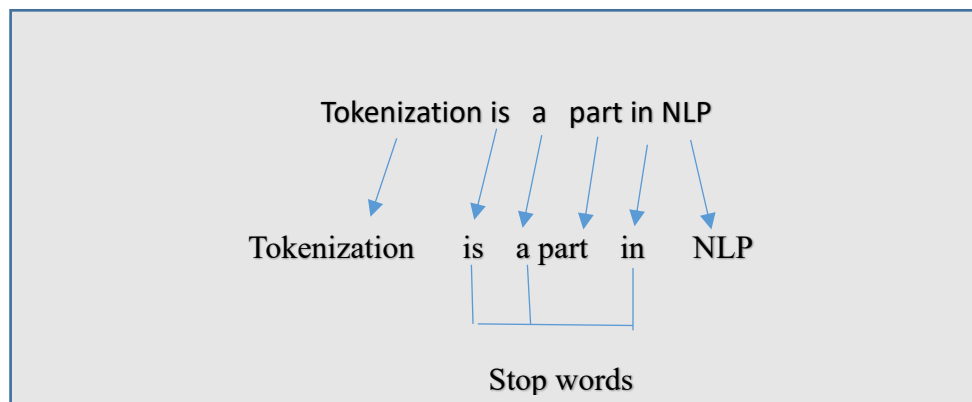
**Fig.3.5 Stemming**

### **Stop words:**

- Stop words are used to remove non-essential words, allowing applications to focus on keywords instead.
- Its main function is to remove the common words that do not add much meaning.
- The stop words are not required in our project because they do not have a place to train or test data.
- If we remove common words without much information, we can save more pages.

- The advantages of punctuation are the small text representation equivalent to faster and faster models and in some ways deleting punctuation does not diminish and may improve performance.
- This method can be done by keeping a list of stops and preventing all stops from being updated and analyzed.
- The necessary module for importing the stop words is **nlTK.corpus**. From nltk.corpus stop words are imported.
- Some of the known stop words are given below:

ourselves, hers, between, yourself, but, again, there, about, once, during, out, very, having, with, they, own, an, be, some, for, do, its, yours, such, into, of, most, itself, other, off, is, s, am, or, who, as, from, him, each, the, themselves, until, below, are, we, ‘these, your, his, though, don, nor, me, were, her, more, himself, this, down, should, our, their, while, above, both, up, to, ours, had, she, all, no, when, at, any, before, them, same, and, been, have, in, will, on, does, yourselves, then, that, because, what.

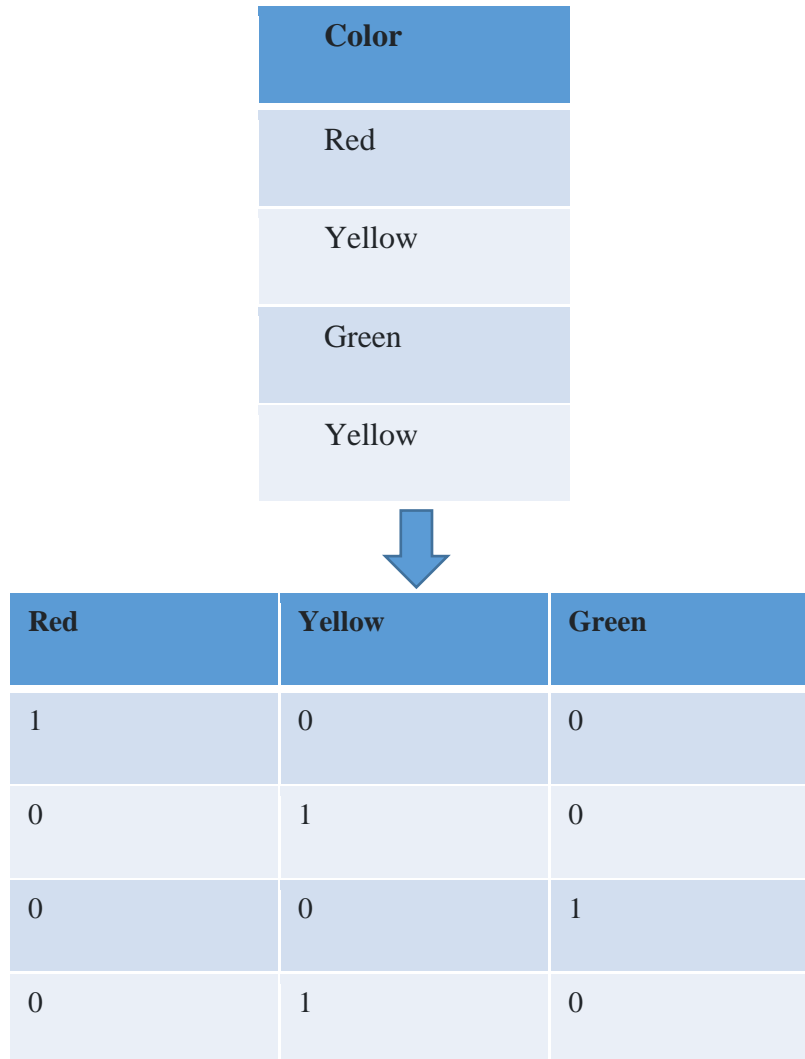


**fig.3.6 Stop words.**

### **Vectorization:**

- Vectorization jargon is an old method of converting input data from its raw format (i.e., text) into real number vectors which is a format supported by ML models. This approach has been around since the advent of computers, works wonders in a variety of domains, and is now widely used in NLP.

- In machine learning, vectorization is an intermediate step. The idea is to find some unique features in the text for the model to practice, by converting the text into numerical vectors.
- After pre-processing data, vectorization can be performed on pre-processed data. Vectorization is the process of converting text data into variable numbers.
- .



**Fig.3.7 Vectorization**

There are many ways to perform vectorization. Depending on the use case and the model, any one of them might be able to do the required task.



## VECTORIZATION TECHNIQUES:

1. **Bag of Words:** The bag of words approach can be executed with the help of the **Count Vectorizer** module, which is imported from the sklearn package.

- 1) Tokenization
- 2) Vocabulary creation
- 3) Vector creation

Although we have used sklearn to create a Word Bag model here, it can be used in many ways, with libraries such as Keras, Gensim, and others. You can also record your own usage of the Word Wallet easily.

### 2. **TF-IDF:**

In the case of the TF-IDF method the performance will be higher compared to the bag of words. It contains two words TF and IDF. The TF represents the term frequency and the IDF represents the Inverse Document Frequency.

TF-IDF, or Term Frequency – Inverse Document Frequency, is a numerical measure intended to indicate how important a word is in a document. While it is another method based on frequencies, it is not as absurd as the Bag of Words.

1) **TF:** TF stands for Term Frequency. It can be understood as a general effect of frequency.

$$TF = \text{Frequency of word in a document} / \text{Total number of words in that document}$$

2) **IDF:** IDF stands for Inverse Document Frequency, but before we go into IDF, we have to make sense of DF - Document Frequency.

$$DF = \text{Document containing word W} / \text{Total number of documents}$$

A logarithm is taken to reduce the effect of IDF on the final figure.

$$TF-IDF = TF * IDF$$

### 3. **Word2Vec:**

This approach was released in 2013 by Google researchers in this paper, and took the NLP industry by storm. In short, this method uses the power of a simple Neural Network to generate embedding of words.

Word to vector can be implemented in two ways.

1. Skip-Gram
2. CBOW

#### **4. Glove:**

GloVe stands for Global Vectors for word representation. It was developed at Stanford. Similar to Word2Vec, the intuition behind GloVe is also creating contextual word embeddings but given the great performance of Word2Vec. GloVe derives semantical meaning by training on a co-occurrence matrix. It's built on the idea that word-word co-occurrences are a vital piece of information and using them is an efficient use of statistics for generating word embeddings. This is how GloVe manages to incorporate "global statistics" into the end result.

#### **5. Fast Text:**

FastText was introduced by Facebook back in 2016. The idea behind FastText is very similar to Word2Vec. However, there was still one thing that methods like Word2Vec and GloVe lacked. We must have noticed one thing that Word2Vec and GloVe have in common — how we download a pre-trained model and perform a lookup operation to fetch the required word embeddings. Even though both of these models have been trained on billions of words, that still means our vocabulary is limited.

Instead of using words to build word embeddings, FastText goes one level deeper, i.e., at the character level. The building blocks are letters instead of words.

Word embeddings obtained via FastText aren't obtained directly. They're a combination of lower-level embeddings.

### **MACHINE LEARNING MODELS:**

Machine learning models are used to predict the correct label for the given test data. So, supervised learning algorithms such as Naïve Bayes and SVM algorithms.

#### **SVM:**

- Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, used for classification and regression problems. However, it is mainly used for Distribution Problems in Machine Learning.

- The goal of the SVM algorithm is to create a better line or decision line that can divide n-dimensional space into classes so that we can easily place a data point in the appropriate category in the future. This best decision-making limit is called the hyperplane.
- The SVM algorithm creates a better line or decision line that can divide n-dimensional space into classes so that we can easily place a data point in the appropriate category in the future. This best decision-making limit is called the hyperplane.
- SVM does well in text-sharing operations. It provides about 80% accuracy of text-separating algorithms.

### **Naive Bayes:**

- Naive Bayes classifiers is a collection of classification algorithms based on the Bayes Theorem. These separators are widely used for text editing and text editing problems.
- The goal of the naïve Bayes algorithm is that all the components that are differentiated are independent of each other. The Naive Bayes algorithm is a family of algorithms in which they all share the same goal
- There are two main assumptions of the naive Bayes algorithm namely, assuming that each variable or element of the same category makes an independent and equal contribution to the result.
- However, the assumptions made by the Naive Bayes are generally incorrect in real world conditions. Because of its independence, it is called naive, that is, it takes something that may not be true.

Therefore, using Naive Bayes and SVM classifiers may be a good idea because the accuracy of these two text-level algorithms is very high compared to any other machine learning algorithms.

### **Bert Model:**

BERT stands for Bidirectional Encoder Representation from Transformers. BERT makes use of transformers. These transformers include two mechanisms an encoder and a decoder.

BERT is an open-source machine learning framework for natural language processing (NLP). BERT is designed to help computers understand the meaning of ambiguous language in the text by using surrounding text to establish context. The BERT framework was pre-trained using text from Wikipedia and can be fine-tuned with question-and-answer datasets.

As opposed to directional models, which read the text input sequentially (left-to-right or right-to-left), the Transformer encoder reads the entire sequence of words at once. Therefore, it is considered bidirectional, though it would be more accurate to say that it's non-directional. This characteristic allows the model to learn the context of a word based on all of its surroundings (left and right of the word).

Using this bidirectional capability, BERT is pre-trained on two different, but related, NLP tasks: Masked Language Modeling and Next Sentence Prediction.

The objective of Masked Language Model (MLM) training is to hide a word in a sentence and then have the program predict what word has been hidden (masked) based on the hidden word's context. The objective of Next Sentence Prediction training is to have the program predict whether two given sentences have a logical, sequential connection or whether their relationship is simply random. Many other organizations, research groups and separate factions of Google are fine-tuning the BERT model architecture with supervised training to either optimize it for efficiency (modifying the learning rate, for example) or specialize it for certain tasks by pre-training it with certain contextual representations.

BERT models are divided to two types:

- 1.BERT base
- 2.BERT Large

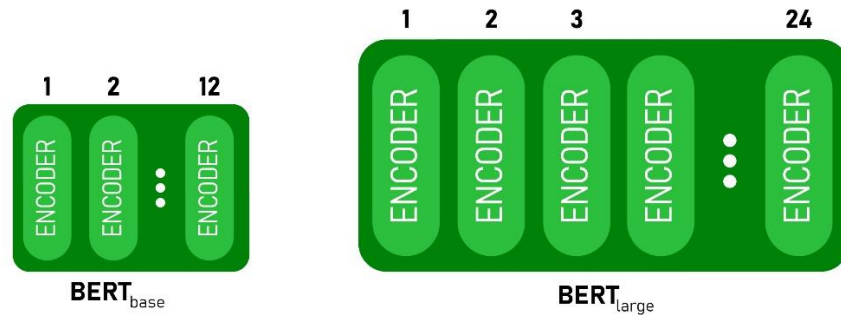


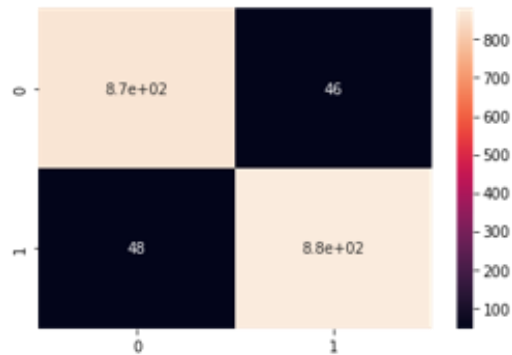
Fig.3.8 BERT models.

Based on the size of the input dataset the BERT model is chosen. BERT model is pre-trained and preprocessed by Google. In order to apply the input data to the BERT model, the pre-trained model will be downloaded into the local system. BERT model will replace the natural language preprocessing and vectorization steps. When compared with the word2voc, bag of words and TF-IDF vectorizations the BERT models increase the performance of the model. Deep Learning algorithms like LSTM and other neural network algorithms will be applied after the BERT model for the text data.

## 4. Results and discussions

Confusion matrix to visualize the accuracy and performance for different models:

### 1.Naïve bayes:

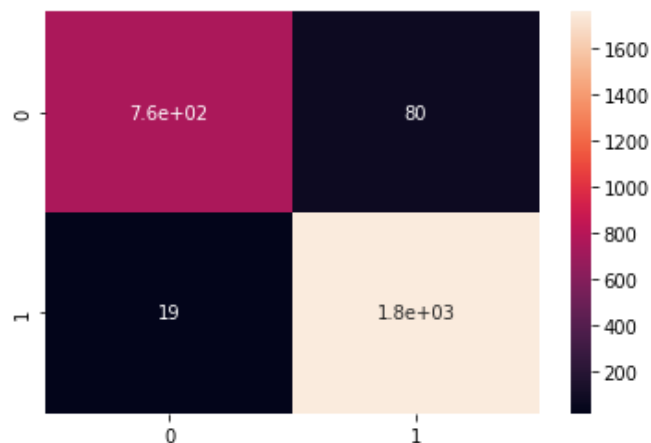


4.1 confusion matrix for naïve bayes.

	Precision	recall	F1_score	support	Accuracy
<b>Fake</b>	0.98	0.89	0.93	837	96.5
<b>TRUE</b>	0.95	0.99	0.97	1776	95.8

Tabel.4.1 several metrics for Naïve byes

### 2.SUPPORT VECTOR MACHINE:



**Fig.4.2 confusion metrics for SVM**

	Precision	recall	F1_score	support	Accuracy
<b>Fake</b>	0.98	0.89	0.93	837	96
<b>TRUE</b>	0.95	0.99	0.97	1776	95.4

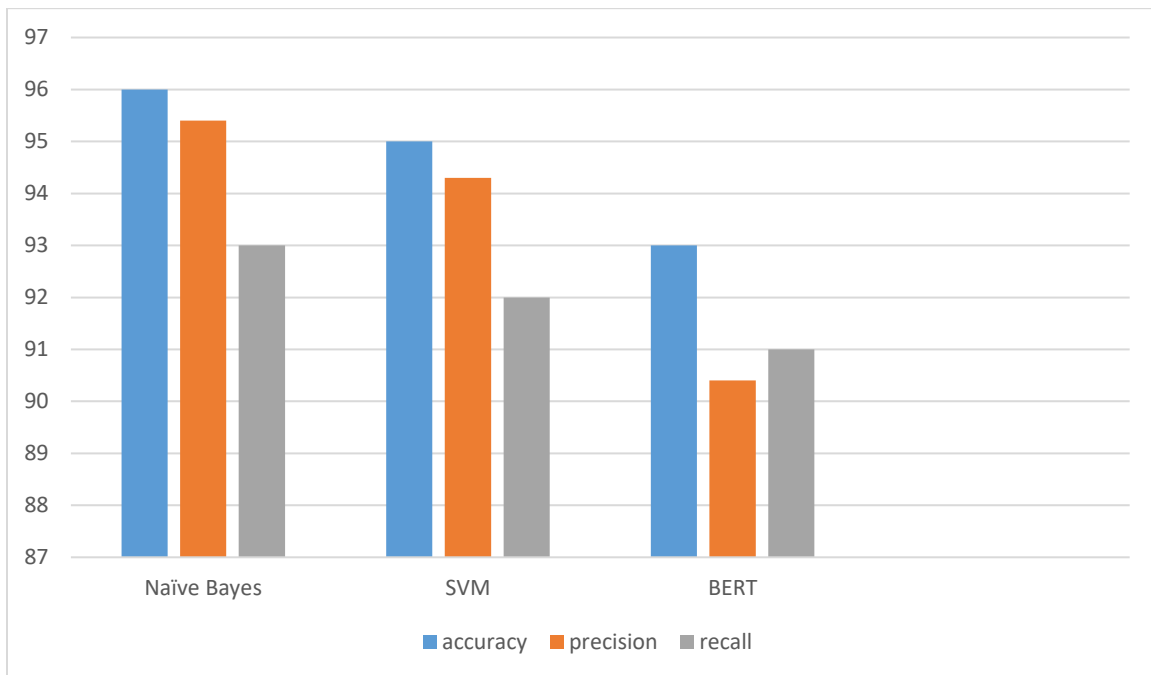
**Tabel.4.2 several metrics for SVM**

### 3.BERT model:

	Precision	recall	accuracy
<b>model</b>	<b>90.5</b>	<b>91.5</b>	<b>92.5</b>

**Table.4.3 several metrics for BERT**

### Representation of several Metrics for the models:



**FIG.4.3 GRAPHICAL REPRESENTATION**

## CONCLUSION AND FEATURE SCOPE

Everyone relies on a variety of online resources for news. It changes the way people use information and news from traditional to digital, resulting in comfort and speed for both newsletters and newsreaders. It changes the way people use information and news from traditional to digital, resulting in comfort and speed for both newsletters and newsreaders. With so many social media platforms like Facebook, Twitter etc., the news is spreading fast among millions of users because social media has made it easier to share information. It makes it easy to access and share data and technology transformation. It is so easy to produce stories on these social media platforms that there may be false stories. These are the challenges that the world is facing due to the fake news on online platforms. It is creating negative impacts on innocent people. Fake news propagators and spammers who are the actual spoilers are generating revenue by spamming the fake news. These challenges must be resolved as or society may face a lot of problems. Spotting fake news on social media platforms is a difficult task as the news stories are dynamic and any user on social media platforms can post anything since they won't verify the user post. Therefore, the user may post fake news on social media platforms to ruin the reputation of a person or a firm. we proposed Natural Language Processing to tackle fake news or misinformation. We employ Natural Language Processing to build automatic online fake news detection since it is concerned with understanding and responding to text data or spoken data. It responds to the given data the same way humans do. There are a variety of strategies available to detect false stories, among which natural language processing is one of the most effective and efficient methods as it relates to interactions between humans and computers.

So, we employ Natural Language Processing to build automatic online fake news detection since it is concerned with understanding and responding to text data or spoken data. It responds to the given data the same way humans do. With NLP, machines can even perform tasks with spoken or written text. The data processing techniques we use in our project are Lemmatization, Tokenization, Stemming, Stop words and Vectorization. This is how false media coverage can be done using artificial intelligence to save innocent people from fraudulent news and senders of spam. False news detection aims to give the user the ability to classify news as false or real. In our methodology, first, we retrieved data from an online news website and social media.



We are working with the IFND dataset that contains national wide news statements. Next, the natural language processing analyzes the retrieved news. Python programming provides a wide range of libraries and tools for various NLP tasks.. The Natural Language Toolkit includes libraries for NLP tasks such as stemming, lemmatization, tokenization (methods that are used for breaking sentences into tokens and trimming words) etc. Next. At Last, we have used machine learning and deep learning algorithms such as naïve Bayes, SVM and bert models to know the accuracy of our project. Naïve Bayes performed well among all the other models. It showed an accuracy of around 96% whereas SVM has given 95% of accuracy and Bert model has given 92% of accuracy.

## APPENDIX

### Step-1: Loading and preprocessing of Dataset.

- Data sets are important to promote the development of a few computational fields, providing scope, robustness, and confidence in results.
- In order for machine learning models to understand how to perform a variety of actions, training data sets must first be integrated into the machine learning algorithm, followed by verification data sets (or test data sets) to ensure that the model accurately describes the data.
- “IFND Dataset” is a large-scale dataset of news. This dataset contains news statements, categories (government, violence, covid etc.) and labels (real or fake).
- This IFND dataset covers only national (India wide) news. It doesn’t cover international news. This IFND dataset was collected only from real-world sources. The real and fake news were collected from different reliable fact-checking websites.
- This data set contains only two type of news fake and real and it contains seven columns. But we will be using only two columns those are news statement and label.
- There are around 51110 news statements in this data set for training and testing.
- After feature extraction the dataset will contain around 8000 observations in the category of covid, since we are working on news regarding covid.

### Step 2: DATA PRE-PROCESSING:

The dataset may contain unwanted data which will reduces the accuracy of the model. In order to remove the unwanted data, we are using the preprocessing steps which include the removing of special character, digits and other content except the alphabets.

Later the text will be converted into lower case which will helps to change the text into vector form.

```
df['text_process']=df['Statement'].map(lambda x: re.sub('(Reuters)',"",x))
df['text_process']=df['Statement'].map(lambda x: re.sub('[A-Za-z0-9]+','',x))
df['text_process']=df['Statement'].map(lambda x: x.lower())
```

```
nltk.download('wordnet')
from nltk.stem import WordNetLemmatizer
def lemmatize(text):
    lm=WordNetLemmatizer()
    tokens=[lm.lemmatize(word) for word in text.split()]
    return " ".join(tokens)
lemmatize(df['text_process'][0])
df['text_process']=df['text_process'].apply(lemmatize)
```

Here every row in the dataset will be preprocessed by applying the tokenization and lemmatization as shown in the above code snippet. The join() method takes an object in a repetitive manner and converts them into a single character unit. Now the preprocessed dataset will be splitted into training and testing modules after that TfidfVectorizer will be applied into train and test modules.

### STEP3: VECTORIZATION

```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,stratify=y,random_state=100)
tfidf=TfidfVectorizer(stop_words='english',ngram_range=(1,3),
                      lowercase=True,max_features=5000)
x_train_vector=tfidf.fit_transform(x_train['text_process'])
x_test_vector=tfidf.transform(x_test['text_process'])
```

### APPLYING THE MODELS TO THE SPLITTED DATASET.

#### Machine learning models:

Naïve bayes Model:

#using naive bayes classifier

```
classifier=MultinomialNB()
classifier.fit(x_train_vector,y_train)
y_pred=classifier.predict(x_test_vector)
y_pred
```

```
def function(news):
    from googletrans import Translator
    t=Translator()
    result=t.translate(news,lang_tgt='en')
    news=result.text
    # print(news)
    inputdata=[news]
```

```
vectorised_data=tfidf.transform(inputdata)
prediction=classifier.predict(vectorised_data)
# print(prediction)
input_user=input()
```

The test data will be taken from the user in any language, it is up to the user comfortability. Using the translator, the data will be translated into English. Preprocessing steps will be applied to the test data. Then the test sentence will be given to machine learning model to predict whether the sentence is fake or true.

```
function(input_user)
```

**Confusion matrix to visualize the accuracy and performance:**

**NAIVE BAYES:**

```
cm=confusion_matrix(y_test,y_pred)
sns.heatmap(cm,annot=True)
print(accuracy_score(y_test,y_pred)
0.9489685124864278
classification_report(y_test,y_pred2)
```

**SVM MODEL:**

```
#using SVM classifier
classifier2=SVC(kernel='linear',random_state=0)
classifier2.fit(x_train_vector,y_train)
y_pred2=classifier2.predict(x_test_vector)
y_pred2
#confusion matrix for naive bayes
cm2=confusion_matrix(y_test,y_pred2)
sns.heatmap(cm2,annot=True)
```

```
#calculating the accuracy of SVM model
accuracy_score(y_test,y_pred2)
```

**0.9621125143513203**

**#calculation of several metrics:**

```
classification_report(y_test,y_pred2)
```

### Applying the BERT model:

For pre-processing, vectorizing and training the data there is a built-in model called BERT. This model will execute all the steps.

```
x_train1,x_test1,y_train1,y_test1=train_test_split(dataset['Statement'],dataset['binary'],stratify=dataset['binary'])
```

```
bert_encoder = hub.KerasLayer("https://tfhub.dev/tensorflow/bert_en_uncased_L-12_H-768_A-12/4")
```

```
bert_preprocess=hub.KerasLayer("https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/3")
```

BERT stands for **Bidirectional Representation for Transformers**, was proposed by researchers at Google AI language in 2018. It is based on the deep network of Transformer encoder, a type of network that can process long texts correctly using self-monitoring. It is double-headed, which means it uses a piece of whole text to understand the meaning of each word. `train_test_split` is a function in selecting the Sklearn model to divide the same data members into two subsets: for training data and test data.

The above two url are the built-in processes one is for pre-processing and another one is for encoding.

### Artificial\_Neural\_network\_modelling:

```
text_input=tf.keras.layers.Input(shape=(),dtype=tf.string,name="text")
```

```
preprocessed_text=bert_preprocess(text_input)
```

```
outputs=bert_encoder(preprocessed_text)
```

```
l=tf.keras.layers.Dropout(0.1,name='dropout')(outputs['pooled_output'])
```

```
l=tf.keras.layers.Dense(1,activation='sigmoid',name='output')(l)
```

```
model=tf.keras.Model(inputs=[text_input],outputs=[l]).
```

**model.summary()**

Model: "model"

Layer (type)	Output Shape	Param #	Connected to
text (InputLayer)	[(None,)]	0	[]
keras_layer_1 (KerasLayer)	{'input_mask': (None, 128), 'input_type_ids': (None, 128), 'input_word_ids': (None, 128)}	0	['text[0][0]']
keras_layer (KerasLayer)	{'encoder_outputs': (None, 128, 768), (None, 128, 768), (None, 128, 768), (None, 128, 768), (None, 128, 768), (None, 128, 768), (None, 128, 768), (None, 128, 768), (None, 128, 768), (None, 128, 768), (None, 128, 768), (None, 128, 768), 'pooled_output': (None, 768), 'default': (None, 768), 'sequence_output': (None, 128, 768)}	109482241	['keras_layer_1[0][0]', 'keras_layer_1[0][1]', 'keras_layer_1[0][2]']
dropout (Dropout)	(None, 768)	0	['keras_layer[0][13]']
output (Dense)	(None, 1)	769	['dropout[0][0]']

**METRICS= [**

**tf.keras.metrics.BinaryAccuracy(name='accuracy'),**

```
tf.keras.metrics.Precision(name='precision'),  
tf.keras.metrics.Recall(name='recall')]
```

precision is the ratio of  $tp / (tp + fp)$  where  $tp$  is the true positive number and  $fp$  is the number of false positive. Accuracy is a distinguishing non-labeling ability as a negative sample. The best value is 1 and the worst value is 0.

recall is literally how many true points were remembered (found), i.e. how many correct points were also found. The accuracy (your formula is incorrect) of how many returned hits were true point which means how many hits were found to be correct hits.

## COMPILING THE MODEL

```
model.compile(optimizer='adam', loss='binary_crossentropy', metrics=METRICS)
```

```
model.fit(x_train1,y_train1,epochs=5)
```

Epoch 1/10

24/24 [=====] – 343s 14s/step – loss:0.6911 – accuracy:0.6058 –  
precision: 0.6005 – recall: 0.6037

Epoch 2/10

24/24 [=====] – 327s 14s/step – loss:0.6911 – accuracy:0.6358 –  
precision: 0.6305 – recall: 0.6037

Epoch 3/10

24/24 [=====] – 325s 14s/step – loss:0.6911 – accuracy:0.6558 –  
precision: 0.6565 – recall: 0.6037

Epoch 4/10

24/24 [=====] – 326s 14s/step – loss:0.6151 – accuracy:0.7058 –  
precision: 0.7005 – recall: 0.6037

Epoch 5/10

24/24 [=====] – 326s 14s/step – loss:0.5582 – accuracy:0.7358 –  
precision: 0.7305 – recall: 0.6037

Epoch 6/10

24/24 [=====] – 326s 14s/step – loss:0.5175 – accuracy:0.7758 –  
precision: 0.7755 – recall: 0.6037

Epoch 7/10

24/24 [=====] – 326s 14s/step – loss:0.4808 – accuracy:0.8158 –  
precision: 0.8105 – recall: 0.6037

Epoch 8/10

24/24 [=====] – 326s 14s/step – loss:0.4651 – accuracy:0.8558 –  
precision: 0.8503 – recall: 0.6037

Epoch 9/10

24/24 [=====] – 326s 14s/step – loss:0.4420 – accuracy:0.8958 –  
precision: 0.8905 – recall: 0.6037

Epoch 10/10

24/24 [=====>>.] – 328s 14s/step – loss:0.3581– accuracy:0.9258 –  
precision: 0.9205 – recall: 0.9037

**Keras model provides a method, compile() to compile the model.**

Compile defines the function of the loss, the setting and the metrics.

Epoch is a term used in machine learning and displays the total number of all training database algorithm learning machine completed. Data sets are usually grouped into clusters (especially if the amount of data is too large).

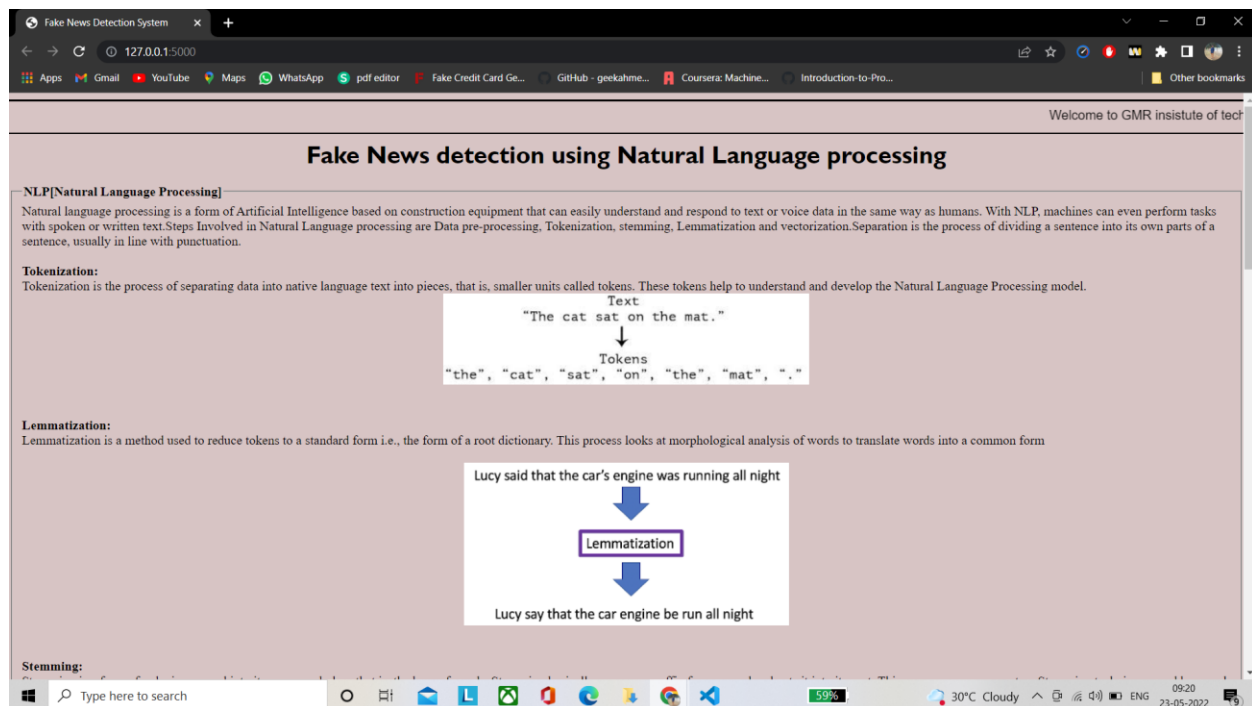
## GRAPHICAL REPRESENTATION:

```
import matplotlib.pyplot as plt
# Dataset generation
data_dict = {'BERT':92, 'SVM':95, 'Naive_bayes':96}
models = list(data_dict.keys())
accuracies = list(data_dict.values())
fig = plt.figure(figsize = (5, 5))
# Bar plot
plt.bar(models, accuracies, color='green',
        width = 0.5)
plt.xlabel("Models")
plt.ylabel("Accuracies")
```



```
plt.title("Accuracies of diffenet model")  
#Graph
```

## GUI



**Vectorization:**  
Vectorization jargon is an old method of converting input data from its raw format (i.e., text) into real number vectors which is a format supported by ML models. This approach has been around since the advent of computers, works wonders in a variety of domains, and is now widely used in NLP.

**Models**

SVM[Support Vector Machine]  
Naive Bayes  
BERT model

**Accuracy**

FaKe News  PrEdicToR

FaKe News  PrEdicToR

Viral test: The truth behind  
ATM dispensing fakes,VIOLENC

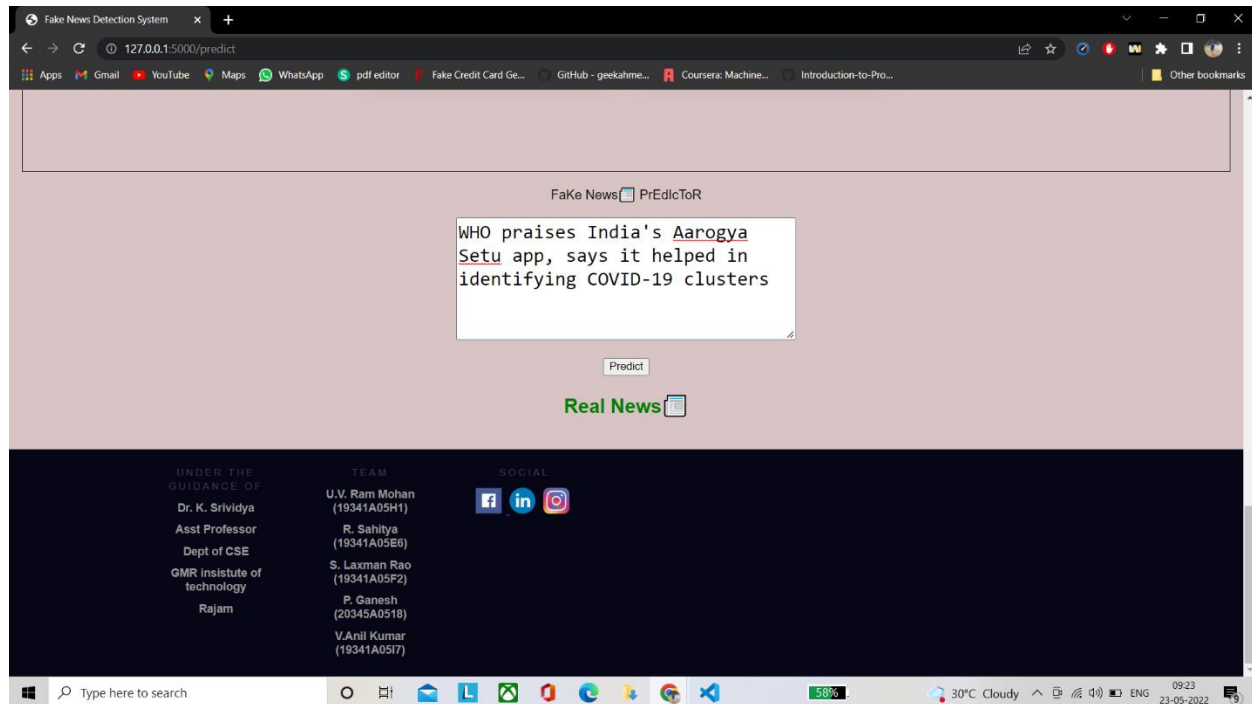
Predict

**Fake News** ⚠️

**UNDER THE GUIDANCE OF**  
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Asst Professor  
Dept of CSE  
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**SOCIAL**  
f l i n i



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